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RANGE IMPROVEMENT



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FOREST SERVICE — U. S. DEPARTMENT OF AGRICULTURE
INTERMOUNTAIN REGION — OGDEN, UTAH

STATEMENT OF PURPOSE

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This publication is printed primarily to inform professional range administrators of important range improvement and management developments and findings. These "NOTES" may include extracts of published papers, unpublished preliminary reports of research work, unpublished reports on administrative studies and personal observations or suggestions of other range administrators. No claim is made as to the accuracy or completeness of studies or conclusions drawn.

All who read these RANGE IMPROVEMENT NOTES are encouraged to submit material for publication, or suggestions for improving its usefulness. Full credit will be given for any material used.

CAN POCKET GOPHERS BE CONTROLLED BY ANHYDROUS AMMONIA (NH₃) ON MOUNTAIN RANGELANDS?

Paul W. Conrad and James M. Laughlin ^{1/}

Organizations and individuals whose responsibilities include animal damage control must constantly search for and conduct research on ways to increase selectivity and efficiency of control programs. In this light, a variety of rodenticides have been used to control pocket gophers. Grain treated with Compound 1080 (sodium monofluoroacetate) has been the most widely used and the most effective (Miller 1953). Gophacide ^{2/} (0,0 bis [p-chlorophenyl] acetimodoylphosphoramidothioate), a relatively new rodenticide, used with grain baits has given satisfactory results (Ward et al. 1967). Several poisonous gases (sulfur dioxide, carbon disulfide, hydrocyanic acid, and methyl bromide) have been used to a limited extent (Storer 1958 and Blonk 1951). The junior author has observed anhydrous ammonia (NH₃) in a vapor form being used with apparent success on canal banks and irrigated croplands in Arizona.

A pilot study was initiated in late September 1970 to test the effectiveness of anhydrous ammonia (NH₃) as a rodenticide on mountain rangelands. In the study, the efficiency of NH₃ was compared with that of grain baits treated with Compound 1080 and with Gophacide for controlling mountain pocket gophers (*Thomomys talpoides*). The study was conducted at an elevation of about 9,000 ft. on the Mud Creek Sheep Allotment, Uinta National Forest in Wasatch County, Utah.

METHODS

The four plots used for this study were irregularly shaped and ranged in area from 1 to 2 acres. They were separated by at least 100 feet and by as much as 0.75 mile and were primarily in areas that had been logged and replanted to conifers 1 or 2 years previously. Each area also contained some aspen and mixed

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grass-forb type vegetation and numerous pocket gopher burrow systems. Three plots were treated: Compound 1080-treated grain baits were used on one plot; Gophacide-treated grain baits on a second; and NH_3 in a vapor form on the third. An untreated fourth plot served as the check to determine the activity of gophers in untreated areas.

Grain baits and NH_3 were added to burrow systems by the hand-probe method (Colorado State University 1960). The equipment for NH_3 application consisted of a tank, a flexible hose, a hand-grip valve, a 3/8-inch pipe that had a pointed 3/8-inch steel rod welded into the tip, and four 1/8-inch release holes 2 inches from the tip (figs. 1A and 1B). The pipe also was used to probe for burrows. Approximately 1 pound of NH_3 was released into each burrow system.

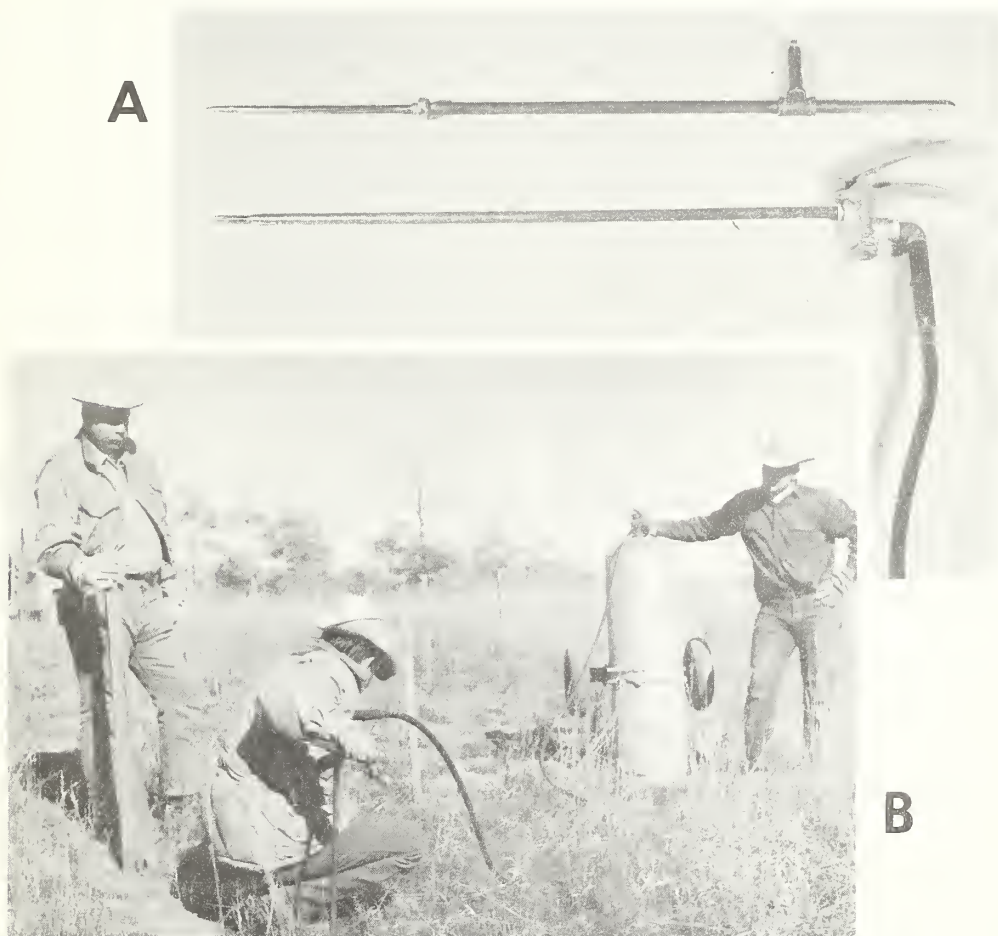


Figure 1.--A. Probes used to locate gopher burrows. Large end of top probe was used to enlarge the hole into burrow so that grain could be deposited. Bottom probe was left in the burrow and anhydrous ammonia (NH_3) was released by the hand valve through four holes near the tip. B, anhydrous ammonia (NH_3) is shown being applied to a pocket gopher burrow system.

The type of probe used for locating burrows and enlarging holes for application of 1080- and Gophacide-treated grain was similar to those described by Storer (1958) (fig. 1A). The bait formulations were 0.2 percent Gophacide on oat groats and 0.1 percent 1080 on whole oats. Approximately 1 ounce of grain was deposited in each burrow.

Recently formed mounds (less than 1 week old) in each of the four plots were marked with flagged stakes prior to treatment. A minimal 40-foot interval was maintained between marked mounds to reduce the possibility of marking a single burrow system more than once.

One week after treatment with grain baits and 24 hours after treatment with NH_3 , the open-hole technique (Barnes et al. 1970) was used to determine the control percentage in each plot, i.e., the percentage that the gopher population had been reduced. This technique consists of opening marked burrow systems and counting plugged and unplugged systems 24 and 48 hours after opening treated and check plots. By comparing the percentage of holes plugged in treated plots with the same figure on the check plot, the control percentage can be estimated. This method is based on the following facts: (1) During most of the year, pocket gophers live one animal to a burrow system; and (2) pocket gophers plug openings into their burrows within a relatively short time.

RESULTS AND DISCUSSION

Table 1 shows the percent control achieved from the various treatments. The control (91 and 94 percent) attained by using Gophacide and 1080, respectively, was similar to that reported for Gophacide and strychnine-treated grain applied by a burrow builder (Barnes et al. 1970). The 46-percent control obtained by using NH_3 was less than half that obtained from the grain baits. However, this control was achieved by using only one application of NH_3 per burrow system, an indication of the need for additional investigations of the efficiency of NH_3 in gopher control. Some questions we feel need to be answered include:

- (1) How much NH_3 should be applied to each burrow system for effective gopher control?
- (2) How many applications of NH_3 should be made in each burrow system to effectively control gophers?
- (3) Will gophers vacate burrows treated with NH_3 ?
- (4) Which season of the year is best to control pocket gophers with NH_3 ?
- (5) Would use of NH_3 in pocket gopher control be economical?
- (6) What effect does NH_3 have on pocket gophers when applied as a fertilizer in the field by large gang-type applicators?
- (7) How far and at what rate does NH_3 diffuse through a burrow system?
- (8) How far will NH_3 diffuse through the soil?
- (9) Is there appreciable loss of NH_3 to the atmosphere?

**Table 1. --Percent control of pocket gophers, Mud Creek
Sheep Allotment, Wasatch County, Utah, 1970**

Treatments	Burrow systems opened	Percent plugged (24 hrs.)	Percent plugged (48 hrs.)	Percent control (48 hrs.) ^{1/}
Gophacide	59	8	8	91
1080	43	5	5	94
NH ₃	56	39	46	46
Check	74	74	85	--

^{1/} % control = 100% - [(% of treated plots plugged/% of controls plugged) 100]

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PESTICIDES PRECAUTIONARY STATEMENT

This publication reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife--if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

SAFETY...

IS A WAY OF THINKING

GET HELP WHEN NEEDED

"No man is an island, entire of itself . . ." cautions the poet, Donne. It is a good point to remember. No matter how self-sufficient a man is, no matter how much of a loner, there are times when he still needs the help of others.

Be it a doctor during an illness, a passing motorist when you're out of gas, or just a kind word from a friend when you're really feeling down, your fellow man can be a handy gent to have around.

That roof-top antenna for your new color TV set should really pull in a strong signal. Don't darken the picture by trying to put it up all by yourself.

What are you trying to prove by lifting a load that's too much for you? That you're a he-man? Or that you can get along in this world without help? You'll need help anyway—to fix the hernia.

There's nothing shameful in admitting that a certain job is too big or risky for you to tackle by yourself. If you've been behaving like an island, throw a bridge across to the mainland. Lots of people will be glad to meet you halfway.

CONSTRUCTION OF TRICK TANK IN CIRCULAR DESIGN

By

Donald E. Cunico, Kenneth J. Vensel, Orville L. Spooner,
and Joe A. Saunders - Gila National Forest

Construction of trick tank in circular design using 24-and 28-gauge sheet-metal on prefabricated 2x4 wooden panels. Circular design was used to achieve added strength to the finished product and ease in prefabrication to give more natural appearance.

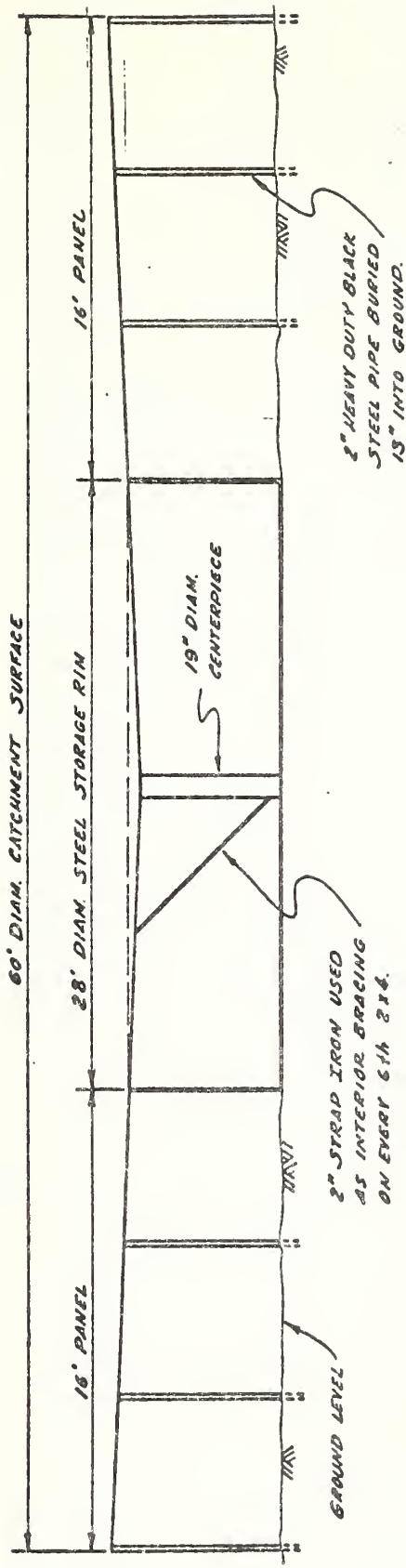
The 16-ft. panels are prefabricated to be attached to the outside circumference of a steel storage rim. We used 2x2 angle iron, 18 inches in length, welded to the rim to join the 16-ft. panels to the 2x4's forming the framework on the inside of the rim (see attached sketches for exact panel and apron measurements). A 24-gauge sheet metal should be used on the outside 16-ft. panel and the lighter 28-gauge metal can be used inside the steel storage rim. All 2x4's are treated with Pentachlorophenol wood preservative prior to prefabrication to resist weathering. The sheet metal is attached to the 2x4 framing by using lead-headed right-ring shank nails. The catchment surface is painted with a nontoxic fish-oil base paint. A red oxide color is used to best blend the project into the surrounding terrain.

The advantages of this type of design are as follows: Evaporation loss is reduced; in the nonpine type the watershed does not tend to collect trash and dirt; cover over the tank eliminates algae formations due to sunlight restriction; and trampling of watershed by livestock and wildlife is eliminated. From a safety standpoint the tank cover eliminates accidental entrance into the water storage area by curious forest users. This cover also eliminates wildlife deaths due to drowning which is always a possibility in the open type rims. Prefabrication of framework permits use of power equipment, thus reducing labor costs during on-site construction. The watershed makes a storage area possible underneath and can be used for salt, feed, and as a shelter. Less surface area is taken out of production. The watershed can be fenced much cheaper in that the wire can be attached to the steel bracing alongside the outside circumference of the watershed.

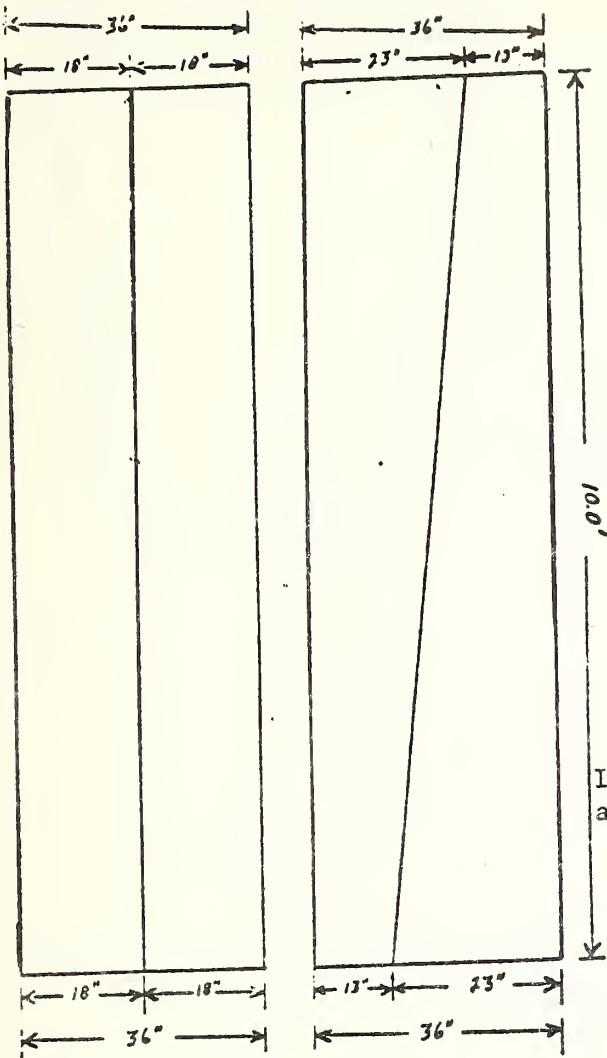
This design should be used only in locations where steel pipelines are not the most economical way to achieve adequate water. The purpose is to develop water in hard-to-get-at locations of light utilization. This type of construction should be carried out by competent carpenters.

(See attached sketches.)

CIRCULAR TRICK TANK DESIGN



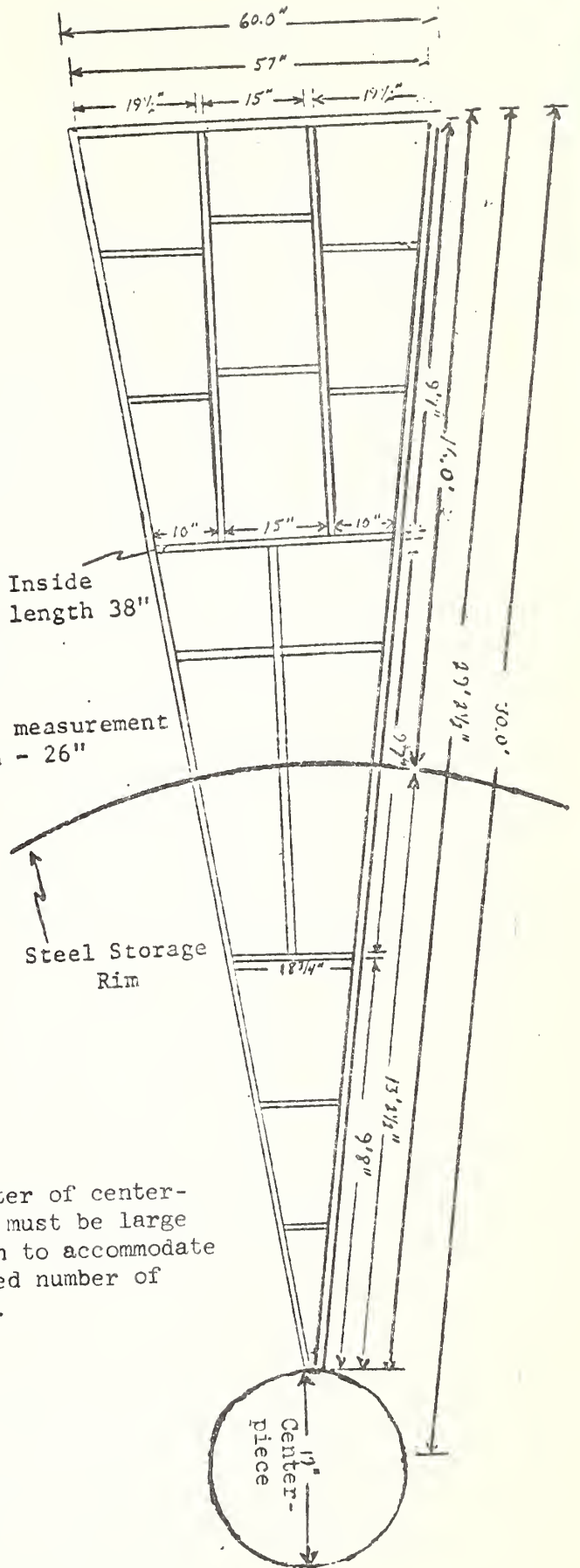
NOTE:
 CATCHMENT SURFACE DROPS 8"
 FROM OUTSIDE CIRCUMFERENCE
 TO CENTERPIECE -- 8" FROM
 OUTSIDE RIM CIRCUMFERENCE
 TO CENTERPIECE.



SHEET METAL - 28 GAUGE

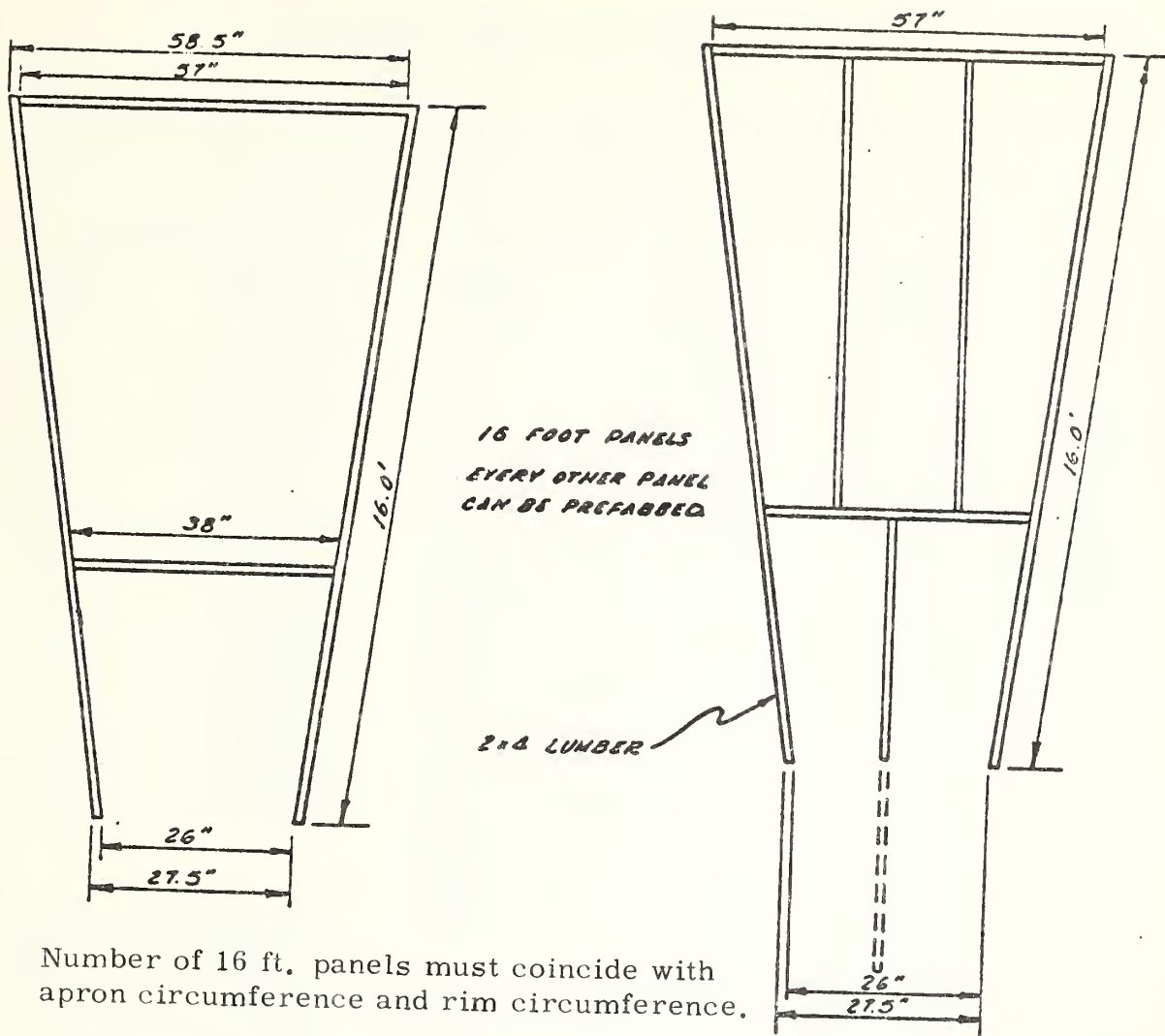
Inside length 38"

Inside measurement at Rim - 26"



All crosspieces for interior braces are cut on a 5 degree angle.

Diameter of center-piece must be large enough to accommodate desired number of 2x4's.



Number of 16 ft. panels must coincide with apron circumference and rim circumference.

EXAMPLE

60 ft. apron diam. = 188' or 2256" circumference
 28 ft. steel rim diam. = 88' or 1056" circumference
 $2256'' - 58.5'' (57'' + \text{width of } 2 \times 4) = 38.6 \text{ panels})$
 $1056'' - 27.5'' (26'' + \text{width of } 2 \times 4) = 38.4 \text{ panels})$ 39 panels

Inside measurements must then be made to coincide with desired sheet metal cuts. The amount of cross bracing will depend on how heavy a gauge sheet metal is used and also the snow load the apron must withstand.

SHEET METAL CUTS

For this particular apron on the middle portion of the outside 10-ft. section, the sheet metal was cut 18" in width making two pieces 18"x10'. The outside portions of this 10 ft. section were cut diagonally 23" on the wide end to 13" on the narrow end. These pieces can be used on the two outer portions of the outside 10-ft. section and also the two portions of the middle 10-ft. section. Sheet metal is nailed to 2x4 lumber with 1-3/4" ring shank lead-headed nails.

FRICITION LOSS - PLASTIC PIPE

Having trouble with your plastic pipelines? The following tables can be used to quickly determine size of pipe needed and amount of "Head" needed to supply a given quantity of water.

3/4-inch Pipe	
FLOW (Gals. Per Minute)	VELOCITY (Feet Per Second)
1.0	.33
1.5	.69
2.0	1.12
2.5	1.68
3.0	2.35
3.5	3.00
4.0	3.90
4.5	4.70
5.0	5.80
6.0	7.70
7.0	10.00
8.0	12.40
9.0	15.30
10.0	18.80

1-1/4-inch Pipe	
FLOW (Gals. Per Minute)	FRICITION LOSS (Feet Per 100 Feet)
1.5	.065
2	.12
3	.22
4	.35
5	.48
6	.65
7	.85
8	1.08
10	1.60
12	2.23
14	2.92
16	3.70
18	4.55
20	5.55
25	8.20
30	11.00
35	14.00

1-1/2-inch Pipe	
FLOW (Gals. Per Minute)	FRICITION LOSS (Feet Per 100 Feet)
1.5	.025
2	.042
3	.085
4	.150
5	.225
6	.300
7	.400
8	.520
9	.630
10	.770
12	1.07
14	1.39
16	1.76
18	2.11
20	2.58
22	2.98
24	3.60
26	4.20
28	4.70
30	5.30
32	5.85
34	6.40
36	7.00
38	7.85
40	8.50
42	9.20
44	9.80
46	10.06
48	10.15
50	10.24
55	10.45
60	10.69

1-inch Pipe	
FLOW (Gals. Per Minute)	FRICITION LOSS (Feet Per 100 Feet)
1.0	.085
1.5	.180
2	.295
3	.63
4	1.04
5	1.49
6	2.00
8	3.30
10	5.15
12	6.95
14	9.20
16	11.40
18	13.8
20	17.0

Pipe Sizes	"A"	"B"
3/4"	15	7
1"	20	10
1-1/4"	27	13
1-1/2"	34	16
2"	44	20
3"	62	29
4"	90	41
6"	140	62

**Friction (Head) Loss for
Insert Adapters and Insert Couplings**

For every ten (10) Insert Adapters used add the number of feet indicated in column "A" to total length of pipe.

For every ten (10) Insert Couplings used add the number of feet indicated in column "B" to total length of pipe.

One foot column of water equals .43 p. s. i.

Rule of Thumb: Multiply factor of 2.31 times p. s. i. , rating of plastic pipe to determine maximum safe difference in elevation for pipeline without using pressure reducing apparatus.

